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Abstract

Although the Caribbean is often seen as a homogenous group of tourist destinations, this is not the case. Countries across the region differ in terms of their key source markets, infrastructural development of their industry and the sources of economic shocks. This paper investigates, through the use of univariate and multivariate time series techniques and monthly data from 1977 to 2002, whether tourist arrivals to the Caribbean have been converging and if there is stable relationship between the tourist cycles in each country. If arrivals to the Caribbean are converging over time, differences between countries, in terms of tourism penetration, should decline. The empirical results presented in the paper suggest that there is no convergence in levels, but in the rates of growth. There also exists a stable long run relationship between the rates of growth of tourist arrivals to various Caribbean countries.

JEL Classification: L83; N16; C22; C23;

1. Introduction

The economic prospects of many Caribbean countries depend significantly on a productive tourism sector. The need for greater collaboration among these countries on issues of sustainable tourism development is well recognised; collaboration and cooperation could lead to greater long-term benefits for their economies, particularly in an increasingly competitive global arena. Integrated tourism development planning, marketing and promotion can increase both effectiveness and efficiency. Joint overseas marketing and promotion would help to achieve benefits of economies of scale and increased value-added in the tourism sector.

In recent years, attempts have been made in the Caribbean to consolidate efforts in sustainable tourism development by forging a common regional approach for the sector. The necessary institutional framework currently exists in the form of the Caribbean Tourism Organisation (CTO). This institution has been mandated by the Caribbean Community (CARICOM) to strengthen regional cooperation in tourism development, planning and promotion.

Economic integration within the Caribbean has accelerated since the Revised Treaty of Chaguaramas establishing the Caribbean Single Market and Economy (CSME) by the Heads of Government of CARICOM on July 5, 2001. Within this context considerable attention has been focused on the issue of regional disparities and the prospects for convergence, as persistent differences in regional growth can lead to disparities in economic welfare. Given the importance of tourism to the economic prospects of Caribbean countries, one of the major sources of regional disparities would be the cyclical properties of tourist arrivals in each country: if differences in the rate of growth of tourist arrivals are diverging, it could result in Caribbean countries drifting further apart.

In this paper, the authors analyse the convergence properties of tourist arrivals to the Caribbean using monthly observations from 1977 to 2002. The study addresses two separate questions regarding the convergence properties of tourist arrivals to the Caribbean: whether the levels and/or rates of growth of tourist arrivals to the region converged during the sample period and if they have converged, does a stable relationship exist.

The plan of the paper is as follows. After the introduction, the authors outline the empirical approach and describe the data used in the study. Section 3 presents the results and Section 4 concludes as well as provides policy recommendations.

2. Statistical Methods

2.1 Convergence and Stability

The time-series approach to the issue of convergence used in many papers is based on the early work of Bernard and Durlauf (1996) and Quah (1992). In this framework, there is convergence between two series if their difference is stationary. Busetti, Forni, Harvey and Venditti (2006), note that two hypotheses can be tested: (1) if the variables are in the process of *converging*, or; (2) if the variables have already converged, does a *stable* relationship exist between them.

The null hypothesis to be tested differs for each case. In the case of convergence, the null hypothesis is that the difference between the two tourist arrivals series is non-stationary:

$$H_0 : x_{it} \equiv (Y_{it} - Y_{*t}) = I(1) \quad \forall i = 1,...,N \tag{1}$$

where Y_{it} is the number of tourist arrivals in country i, Y_{*t} is number of tourist arrivals in the benchmark country, x_{it} is the difference in the number of arrivals of country i relative to the benchmark country, $N+1$ is the total number of Caribbean countries studied, and $I(1)$ denotes a unit root process. Unit root tests can therefore be used to evaluate the null hypothesis given in Equation (1).

In the case of stability, it is more appropriate to test the null that the difference between the two tourist arrivals series is stationary:

$$H_0 : x_{it} \equiv (Y_{it} - Y_{*t}) = I(0) \quad \forall i = 1,...,N \tag{2}$$

where $I(0)$ denotes a stationary stochastic process. Since the null hypothesis being evaluated has changed, a unit root test different from the type employed to test Equation (1) is appropriate.

When the tests fail to reject (1) and reject (2), this would suggest that there is no convergence within the economic grouping. On the other hand, if the tests reject (1) and (2), then this is evidence that tourist arrivals are converging. Finally, if the tests reject (1), and fail to reject (2) then the tourist arrivals series have already converged and have a stable relationship.

2.2 Statistical Techniques

In this section of the paper the authors describe the procedures used to test for convergence and stability.

One of the most popular unit root tests in the applied econometric literature is the augmented Dickey-Fuller (ADF) test. The ADF test uses a regression of the following form:

$$\Delta x_t = \varphi + \alpha x_{t-1} + \sum_{j=1}^{k} \beta_j \Delta x_{t-j} + \varepsilon_t \tag{3}$$

where φ is a constant, ε_t is a stationary error and the lagged terms of the dependent variable are included to control for serial correlation in the residuals. The null hypothesis of a unit root process is rejected if the coefficient α is significantly less than zero.

The authors also compute the relatively new GLS-based alternative of Elliot, Rothenberg and Stock (ERS) (1996) denoted by DF-GLS, which has been found to be more powerful for detecting convergence (see Harvey and Bates, 2003). The ERS test is based on a quasi-differencing regression that depends on the value *a*, the point alternative against which we wish to test the null:

$$d(x_t \mid a) = d(g_t \mid a)'\psi(a) + \eta_t \tag{4}$$

where g_t are exogenous regressors such as a constant or a constant and trend and $d(x_t \mid a)$ is defined as:

$$d(x_t \mid a) = \begin{cases} x_t & if\ t = 1 \\ x_t - ax_{t-1} & if\ t > 1 \end{cases}$$

ERS suggest the use of $a = \bar{a}$ such that:

$$\bar{a} = \begin{cases} 1 - 7/T & if\ g_t = \{1\} \\ 1 - 13.5/T & if\ g_t = \{1, t\} \end{cases}$$

The DF-GLS test involves estimating Equation (3) using the GLS detrended data defined as:

$$x_t^d = x_t - g_t{}'\hat{\psi}(\bar{a}). \tag{5}$$

Since the data is already detrended, the constant and trend are excluded from the specification. As before, the null hypothesis of a unit root process is rejected if the coefficient α is significantly less than zero.

Another unit test employed by the authors is the ERS Point Optimal Test which is based on Equation (4). The residuals from this regression, $\hat{\eta}_t(a)$, are used to construct the ERS test statistic given as:

$$ERS_T = \frac{RSS(\bar{a}) - (\bar{a})RSS(1)}{f_0} \tag{6}$$

where $RSS(a) = \sum \hat{n}_t^2(a)$, the sum-of-squared residuals function and f_0, is an estimator of the residual spectrum at frequency zero.

The final univariate test employed is the Ng and Perron (2001) test for unit roots. This test is based on the GLS detrended data given by Equation (5). The authors employ the modified version of the ERS Point Optimal Statistic denoted NP:

$$NP_T^d = \begin{cases} \left[\bar{c}^2\varsigma - \bar{c}T^{-1}(x_T^d)^2\right]/f_0 & \text{if } x_t = \{1\} \\ \left[\bar{c}^2\varsigma + (1-\bar{c})T^{-1}(x_T^d)^2\right]/f_0 & \text{if } x_t = \{1,t\} \end{cases} \tag{7}$$

where $\bar{c} = \begin{cases} -7 & if\ g_t = \{1\} \\ -13.5 & if\ g_t = \{1,t\} \end{cases}$ and $\varsigma = \sum_{t=2}^{T}(x_{t-1}^d)^2/T^2$.

To test for stability, the authors employ the Kwiatkowski et al. (1992) test where the series is assumed to be (trend) stationary under the null against the alternative of non-stationarity of the series (or a unit root). Kwiatkowski et al. (KPSS) assume that a variable can be decomposed into a deterministic trend ($x(t)$), a random walk ($x(s)$) and a stationary error:

$$x_t = x(t) + x(s) + \varepsilon_t \tag{8}$$

where $x(s)_t = x(s)_{t-1} + u_t$. If the variable is stationary, then $\sigma_u^2 = 0$. This hypothesis can be tested by computing the ratio of the partial sums $S(t) = \sum_{t=1}^{N}\hat{\varepsilon}_t$ of the residuals from estimating Equation (8):

$$LM = \sum_{t=1}^{N} S(t)^2 \Big/ \hat{\sigma}_\varepsilon^2 . \tag{9}$$

where $\hat{\sigma}_\varepsilon^2$ is the estimate of the variance of the residuals. If the computed statistic is larger than the asymptotic critical value the null hypothesis of stationarity is rejected.

One can also test for convergence and stability across a group of countries using multivariate tests. Let X_{it} be the vector of contrasts between each of the $N+1$ countries and a benchmark country. The authors use three multivariate tests for convergence: those by Levin, Lin and Chu (2002), Breitung (2000) and Im, Pesaran and Shin (1997). The Levin, Lin and Chu and Breitung tests both use a multivariate version of Equation (3):

$$\Delta x_{it} = \alpha_i x_{it-1} + \sum_{j=1}^{k_i} \beta_{ij} \Delta x_{it-j} + \varepsilon_{it} \tag{10}$$

where the lag orders for the difference terms are given by k_i. The Levin, Lin and Chu as well as the Breitung tests both assume that $\alpha_i = \alpha$, or that the persistence parameter is common across all cross-sections (i.e., there is a common unit root process). The Levin, Lin and Chu derive estimates of α from values for Δx_{it} and Δx_{it-1} that are standardised and free from autocorrelation and deterministic components. The null hypothesis, of a unit root process, is then rejected if the coefficient, α, is significantly less than zero. Breitung removes only the autocorrelation components before standardisation. After standardisation, then the deterministic components are removed. Besides these two differences, the two tests are conceptually quite similar. The Im, Pesaran and Shin (1997) test, in contrast, allows the persistence parameter, α_i, to vary across cross-sections. The test estimates separate ADF regressions for each cross-section, averages and standardises the *t*-ratios on α_i to obtain the test statistic.

To test for stability the authors employ the Hadri (2000) stationarity test. Similar to the KPSS test, it has a null hypothesis of no unit root in any of the series in the panel. The

Hadri test is based on the residuals from the individual OLS regressions of x_{it} on a constant, or on a constant and a trend. The test statistic is then obtained by averaging the individual test statistics:

$$LM = \frac{1}{N}\left(\sum_{i=1}^{N}\left(\sum_{i} s_i(t)^2 / T^2\right) / \bar{f}_o\right) \tag{11}$$

where $\bar{f}_0$ is the average of the individual estimators of the residual spectrum at frequency zero, and $s_i(t)$ are the cumulative sums of residuals.

The traditional panel unit root tests outlined above assume that units in the panel are independent. However, in the case of Caribbean tourist arrivals this assumption appears unrealistic. Applying these traditional panel unit root tests to series characterised by cross-section dependencies can lead to size distortion and low power (Banerjee, Marcellino and Osbat, 2004). The authors test for cross-section dependence using the Breusch and Pagan (1980) Lagrange Multiplier (LM) statistic for testing the null of zero cross-equation error correlations. The test is based on the following LM statistic:

$$CD_{LM} = T\sum_{i=1}^{N-1}\sum_{j=i+1}^{N}\hat{\rho}_{ij}^2 \tag{12}$$

where $\hat{\rho}_{ij}^2$ is the sample estimate of the pair-wise correlation of the residuals. CD_{LM} is asymptotically distributed as chi-squared with $N(N-1)/2$ degrees of freedom.

To explicitly account for cross-sectional dependence the authors employ the covariate recursive mean adjustment (RMA) unit root tests of Sul (2005) to detect whether the common factor is stationary. This test is appropriate when N is relatively large (greater than 20). Consider a modified autoregressive panel model of the following form:

$$y_t - c_{t-1} = \rho(y_{t-1} - c_{t-1}) + \sum_{j=1}^{p} \phi_j \Delta y_{t-j} + u_t \tag{13}$$

where c is a common factor which is assumed to satisfy the conditions $E(c_{t-1}u_t) = 0$, $E(c_{t-1}) = a$ and $E\left[\sum_{t=2}^{T}(y_{t-1} - c_{t-1})(c_{t-1} - E(c_{t-1}))\right] < \mathrm{O}(T)$. The unit root test statistic is therefore given as $t = \frac{\hat{\rho}}{\sqrt{V(\hat{\rho})}}$. The critical values for the test statistic are provided in Sul (2005), with limiting values of -1.88 for the case of a constant and -1.86 for a linear trend model. These values are invariant to T.

If $N < 20$, the number of common factors is difficult to estimate and most panel unit root tests perform poorly (Bai and Ng, 2002). Sul (2005) shows that for a small N but large T, cross-section dependence can be asymptotically handled by utilising panel feasible generalised least squares estimation. Employing the model of the following form:

$$y_{it} - c_{it-1} = \rho(y_{it-1} - c_{it-1}) + u_{it} \tag{14}$$

where $u_{it} \sim N(0, \Sigma_u)$ and the off-diagonal terms of Σ_u (which is assumed to be known) are not equal to zero. Now letting $\Sigma_u^{-1} = \Lambda'\Lambda$, the following transformed vectors can be derived: $y_t^{+} = y_t\Lambda'$ and $c_{t-1}^{+} = c_{t-1}\Lambda'$. Taking the *i*th elements of y_t^{+}, c_{t-1}^{+} and u_t^{+}, one obtains:

$$y_{it}^{+} - c_{it-1}^{+} = \rho(y_{it-1}^{+} - c_{it-1}^{+}) + u_{it}^{+}. \quad (15)$$

The test statistic is therefore given as $(\rho_{PGLS} - 1)/\sqrt{Var(\hat{\rho}_{PGLS})}$ which is normally distributed with mean zero and a variance of one.

3. Convergence and Stability of Tourist Arrivals

The procedures described in the preceding section are employed to evaluate the convergence and stability of visitor arrivals for 22 Caribbean countries. These countries are: Antigua and Barbuda, Aruba, the Bahamas, Barbados, Bermuda, British Virgin Islands, Cayman Islands, Curacao, Dominica, Dominican Republic, Grenada, Haiti, Jamaica, Martinique, Montserrat, St. Kitts and Nevis, St. Lucia, St. Martin, St. Vincent and the Grenadines, Suriname, Trinidad and Tobago and the United States Virgin Islands. The data on monthly tourist arrivals from 1977 to 2002 is taken from the Caribbean Tourism Organisation's Annual Statistical Digest for various years.

Before statistical tests are conducted, the observations are transformed into natural logarithms. The resulting log visitor arrivals series for the Bahamas (the benchmark country) is then subtracted from that for each of the remaining 21 Caribbean nations, and this is used as the level differential. Additionally, the authors also calculated series on the differences in growth from the benchmark country. In this case, the log change in each series was calculated, and the log change for the Bahamas was subtracted from that for all the other countries. Summary statistics for the resulting series are provided in Table 1. The mean level differences presented in the table are all negative, since the Bahamas is the largest tourist destination in the region. The level difference series for the Dominican Republic was the most volatile (measured using the standard deviation) during the period, while that for Barbados was the least volatile. Examining the differences in growth from the benchmark country, one will notice that most countries experienced a faster rate of economic expansion between 1977 and 2002 when compared to the Bahamas; the only exceptions were Montserrat (who suffered from the effects of a volcanic eruption on the island), Bermuda and the US Virgin Islands. The Dominican Republic had the fastest rate of growth in tourist arrivals during the period, with monthly visitors to the island rising significantly during the review period.

As a preliminary investigation of convergence in tourist arrivals, Figure 1 plots the standard deviation between level differences in tourist arrivals to each country from 1977M1 to 2002M12. A visual inspection of the figure reveals that the standard deviation between level differences was quite high during the 1970s. During the 1980s and early 1990s, however, the level differences of tourist arrivals fell, indicating some measure of convergence during the period. However, after 1995, there was some measure of divergence, as the number of visitors to the Dominican Republic accelerated significantly. A similar analysis is done using the differences in growth and the results are given in Figure 2. The results confirm our findings above that differences between Caribbean states were quite large during the 1970s; however, during the 1980s and early 1990s there was a fall in the cross-country standard deviation of differences in growth. After some degree of divergence between 1995 and 1999, the differences in growth have continued on the slight downward trend established during the 1980s and early 1990s.

Next the study presents univariate and multivariate tests of convergence and stability. The results of the univariate unit root and stationarity tests are given in Table 2. The table provides the critical values and the test statistics for each of the contrasts between countries. The second, third, fourth, fifth and sixth columns present the tests for convergence while the final column displays the test for stability. Most of the unit root tests fail to reject the null hypothesis of non-convergence in levels for tourist arrivals to the Caribbean. Table 2 therefore seems to provide evidence that tourist arrivals to the Caribbean, in level terms, are not converging.

The other empirical issue addressed is whether level tourist arrival differentials, even though they may not be converging, have a stable relationship. Failure to reject the null hypothesis in the case of the KPSS test would suggest that there exists a stable relationship between the levels of tourist arrivals relative to the benchmark country. The results of the univariate tests for stability are displayed in the final column of Table 2. The test statistics for most countries are greater than the tabulated critical values and therefore indicate that the null hypothesis of stability can be rejected at classical levels of testing.

Even though the levels of tourist arrivals to Caribbean countries may not be converging over the long run, this does not necessarily imply that the countries in the region have dissimilar growth patterns. In the extreme, assume that all the countries in the Caribbean grow at the same rate; this would suggest that the differences in growth would form a stationary series, but the levels of tourist arrivals would never converge. To investigate whether this is the case for the Caribbean, the authors apply similar univariate tests for convergence and stability to the growth differences series and the results are provided in

Table 3. The table shows that the majority of tests statistics for the growth contrasts are highly significant, which suggests that the null hypothesis of a unit root can be rejected, i.e., growth in arrivals to the Caribbean are converging. Similarly, the KPSS tests statistics are below the tabulated critical values (with the exceptions of the Cayman Islands and St. Kitts and Nevis), indicating a stable relationship between the rates of tourist arrivals growth in the various Caribbean countries.

Rather than using pair-wise tests, the authors also exploit the panel structure of the database to benefit from the superior power properties of multivariate tests of the convergence and stability hypotheses. The results for level and growth differences are presented in Tables 4 and 5, respectively. The multivariate tests that assume panel independence present results that are very similar to those obtained earlier: there is no convergence in the level series, but, the growth in visitor arrivals to the Caribbean is converging and has a stable relationship.

These traditional panel unit root tests assume that the units in the panel are independent – a fairly strong assumption for tourist arrivals to the Caribbean. To evaluate this assumption the Breusch and Pagan (1980) LM test statistic is calculated for both the level and growth panels. In both cases, the tests statistic exceeds the critical chi-square table value at normal levels of testing (387.99 for the level panel and 263.79 for the growth panel compared to a 1% table value of 244.81). Given the evidence in favour of cross section dependence the Sul (2005) panel unit root tests are also reported in Tables 4 and 5. Similar to previous results, these tests show that while the level contrasts are not on a convergent path, the growth contrasts are stationary at ordinary levels of testing.

4. Conclusions and Policy Recommendations

This paper employs a univariate and multivariate framework to examine the convergence and stability properties of tourist arrivals to 22 Caribbean countries between 1977 and 2002. In the study, convergence is defined as the rejection of the null hypothesis of a unit root in the bivariate contrasts series. On the other hand, stability is said to exist if the null hypothesis of stationarity between the two series is not rejected at classical levels of testing.

The empirical results presented in the paper suggest that while the levels of tourist arrivals to the of the group of countries have not been converging over time, the rate of growth in arrivals is converging and has a stable long run relationship. This result is robust to the presence of cross-section dependence.

There are several implications of these findings. The findings of cross-section dependence and convergence in the growth rates suggest (1) that each country faces similar risks; and (2) that a common tourism marketing programme for the region would be successful. Given the differences in the tourism product offered by each country, such a programme should focus on selling the Caribbean as a single tourist destination, but in the spirit of the Lancaster Model of consumer demand, the programme should also market the peculiar and unique attributes of each country.

On the other hand, the finding that there is no convergence in the levels suggests that countries may need to diversify their markets. Since the tests for convergence in this paper used aggregate tourist arrivals, future research will disaggregate the data based on the main source markets: the United States (US), the United Kingdom (UK), Canada and CARICOM, to determine the nature of the underlying convergence dynamics. The results from the disaggregated analysis would help countries to determine which markets should be targeted for diversification.

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Table 1: Descriptive Statistics

	Mean	Maximum	Minimum	Std. Dev.	Observations
Level Differences					
LEV_ANB	-2.224	-1.177	-3.310	0.340	312
LEV_ARU	-1.343	-0.227	-2.285	0.505	312
LEV_BAR	-1.217	-0.166	-1.910	0.227	312
LEV_BER	-1.320	0.432	-2.598	0.565	312
LEV_BVI	-2.262	-1.109	-5.477	0.571	312
LEV_CAY	-1.891	-0.928	-3.004	0.421	312
LEV_CUR	-2.032	-1.028	-2.999	0.320	312
LEV_DOM	-3.710	-2.398	-6.246	0.567	312
LEV_DOMR	-0.257	1.061	-1.931	**0.706**	300
LEV_GRE	-3.072	-1.422	-4.384	0.528	312
LEV_HAI	-2.359	-1.164	-4.379	0.335	312
LEV_JAM	-0.620	0.664	-1.813	0.392	312
LEV_MAR	-1.707	-0.580	-2.895	0.540	312
LEV_MON	-4.643	-3.354	-6.686	0.497	312
LEV_STK	-3.226	-1.917	-4.818	0.473	312
LEV_STL	-2.237	-1.169	-3.303	0.428	276
LEV_SMAR	-1.329	-0.156	-2.504	0.363	312
LEV_STVG	-3.349	-2.197	-4.374	0.317	312
LEV_SUR	-3.012	-1.738	-4.254	0.439	312
LEV_TT	-1.773	-0.654	-2.763	0.377	228
LEV_USVI	-0.803	0.362	-2.025	0.337	312
Differences in Growth					
GR_ANB	0.032	1.304	-1.398	0.245	300
GR_ARU	0.045	1.049	-0.958	0.182	300
GR_BAR	0.013	1.258	-1.137	0.158	300
GR_BER	**-0.030**	1.380	-1.349	0.166	300
GR_BVI	0.061	2.878	-1.629	0.366	300
GR_CAY	0.047	1.408	-1.094	0.171	300
GR_CUR	0.002	1.253	-1.377	0.232	300
GR_DOM	0.054	1.849	-1.555	0.322	300
GR_DOMR	**0.086**	1.508	-1.123	0.182	288
GR_GRE	0.049	1.283	-1.352	0.224	300
GR_HAI	0.005	2.182	-2.154	0.323	300
GR_JAM	0.051	1.439	-1.233	0.209	300
GR_MAR	0.052	1.280	-0.739	0.211	300
GR_MON	-0.015	1.490	-1.400	0.354	300
GR_STK	0.047	1.675	-1.876	0.311	300
GR_STL	0.043	1.531	-1.451	0.193	264
GR_SMAR	0.022	1.225	-1.717	0.275	300
GR_STVG	0.043	1.219	-1.261	0.215	300
GR_SUR	0.039	0.878	-0.858	0.243	300
GR_TT	0.030	1.345	-1.374	0.227	216
GR_USVI	**-0.033**	1.462	-1.332	0.243	300

Table 2: Univariate Tests for Convergence and Stability - Levels

	Tests for Convergence					*Test for Stability*
	ADF – No Intercept	ADF - Intercept	DF-GLS	ERS	NP	KPSS
Critical Values –						
1%	-2.573	-3.452	-2.573	1.955	1.780	0.739
5%	-1.942	-2.871	-1.942	3.220	3.170	0.463
10%	-1.616	-2.572	-1.616	4.414	4.450	0.347
LEV_ANB	-1.174	-2.047	-0.798	**0.973**	**0.914**	**1.942**
LEV_ARU	-1.602	-1.003	-0.004	2.540	**2.379**	**1.939**
LEV_BAR	-0.803	-2.474	-2.495	**0.446**	**0.448**	**0.757**
LEV_BER	1.621	-0.281	-1.664	**0.802**	**0.763**	**1.876**
LEV_BVI	-1.499	-2.095	-1.882	**0.539**	**0.534**	**1.698**
LEV_CAY	**-2.126**	-2.429	0.180	8.486	7.570	**1.991**
LEV_CUR	-0.069	-2.138	-2.071	**0.409**	**0.404**	0.312
LEV_DOM	**-2.503**	-0.769	0.764	**0.627**	**0.592**	**2.122**
LEV_DOMR	**-2.269**	-1.399	1.629	6.905	6.269	**2.024**
LEV_GRE	**-1.939**	-0.415	0.667	**1.697**	**1.605**	**2.062**
LEV_HAI	-0.335	**-3.020**	**-1.630**	**0.248**	**0.246**	**0.630**
LEV_JAM	**-2.047**	-1.565	-0.112	**1.650**	**1.535**	**2.038**
LEV_MAR	**-2.261**	-1.432	-0.105	**1.198**	**1.138**	**2.058**
LEV_MON	0.118	-1.894	**-1.752**	**0.515**	**0.517**	**1.009**
LEV_STK	**-1.775**	**-2.819**	0.194	**2.460**	**2.175**	**1.583**
LEV_STL	**-2.259**	-0.859	-0.699	**1.163**	**1.161**	**1.988**
LEV_SMAR	-0.961	-2.238	**-1.718**	**0.776**	**0.757**	**1.040**
LEV_STVG	-1.195	**-2.845**	-0.407	**1.057**	**0.972**	**1.213**
LEV_SUR	-1.610	-1.499	0.360	**1.017**	**0.917**	**2.004**
LEV_TT	-1.241	-0.191	0.382	**0.455**	**0.433**	**1.918**
LEV_USVI	-0.040	**-2.680**	-0.059	5.264	4.584	**1.184**

Note: Bolded results indicate rejection of the null.

Table 3: Univariate Tests for Convergence and Stability - Growth

	Tests for Convergence					*Test for Stability*
	ADF – No Intercept	ADF - Intercept	DF-GLS	ERS	NP	KPSS
Critical Values –						
1%	-2.573	-3.453	-2.573	1.950	1.780	0.739
5%	-1.942	-2.871	-1.942	3.215	3.170	0.463
10%	-1.612	-2.572	-1.616	4.405	4.450	0.347
GR_ANB	**-5.682**	**-5.886**	**-1.905**	**0.395**	**0.370**	0.130
GR_ARU	**-3.237**	**-3.447**	**-2.860**	**0.232**	**0.225**	0.125
GR_BAR	**-5.952**	**-5.974**	**-2.819**	**0.223**	**0.211**	0.077
GR_BER	**-4.793**	**-5.280**	-1.050	**1.242**	**1.075**	0.036
GR_BVI	**-3.857**	**-4.030**	**-3.968**	**0.143**	**0.143**	0.107
GR_CAY	**-3.232**	**-4.696**	**-4.712**	**0.165**	**0.165**	**0.445**
GR_CUR	**-4.054**	**-4.051**	**-2.274**	**0.260**	**0.246**	0.107
GR_DOM	**-4.278**	**-7.048**	**-7.061**	**0.126**	**0.127**	0.066
GR_DOMR	**-3.130**	**-5.179**	**-4.677**	**0.155**	**0.155**	0.202
GR_GRE	**-3.738**	**-4.229**	**-1.696**	**0.303**	**0.281**	0.081
GR_HAI	**-6.579**	**-6.565**	**-3.508**	**0.162**	**0.161**	0.055
GR_JAM	**-4.399**	**-4.752**	**-1.672**	**0.478**	**0.437**	0.120
GR_MAR	**-3.635**	**-4.028**	**-3.801**	**0.145**	**0.144**	0.150
GR_MON	**-3.166**	**-3.178**	**-2.277**	**0.210**	**0.209**	0.133
GR_STK	**-4.275**	**-5.030**	-1.012	**0.469**	**0.423**	**0.494**
GR_STL	**-5.977**	**-6.770**	**-1.631**	**0.390**	**0.355**	0.096
GR_SMAR	**-4.665**	**-4.697**	**-4.429**	**0.308**	**0.308**	0.218
GR_STVG	**-4.279**	**-4.270**	**-3.941**	**0.106**	**0.106**	0.206
GR_SUR	**-3.016**	**-3.101**	**-3.045**	**0.197**	**0.199**	0.081
GR_TT	**-3.781**	**-4.089**	**-4.007**	**0.179**	**0.179**	0.296
GR_USVI	**-3.019**	**-3.088**	**-2.973**	**0.206**	**0.207**	0.228

Note: Bolded results indicate rejection of the null.

Table 4: Multivariate Tests for Convergence and Stability - Levels

	Statistic	P-value	Cross-Sections	Observations
Tests for Convergence				
Levin, Lin and Chu	0.970	0.834	21	6115
Breitung	0.923	0.822	21	6094
Im, Pesaran and Shin	**-1.330**	0.092	21	6115
Tests of Convergence – Cross Section Dependence				
PRMA-FGLS	-0.735	0.304	21	6115
RMA	**-10.270**	0.000	21	6115
Test for Stability				
Hadri	51.016	0.000	21	6420

Note: Bolded results indicate rejection of the null.

Table 5: Multivariate Tests for Convergence and Stability - Growth

	Statistic	P-value	Cross-Sections	Observations
Tests for Convergence – Cross Section Independence				
Levin, Lin and Chu	**-3.569**	0.000	21	5883
Breitung	**-11.594**	0.000	21	5862
Im, Pesaran and Shin	**-16.603**	0.000	21	5883
Tests of Convergence – Cross Section Dependence				
PRMA-FGLS	**-17.129**	0.000	21	5883
RMA	**-8.648**	0.000	21	5883
Test for Stability				
Hadri	0.049	0.480	21	6168

Note: Bolded results indicate rejection of the null.

Figure 1: Standard Deviation of Differences in Level

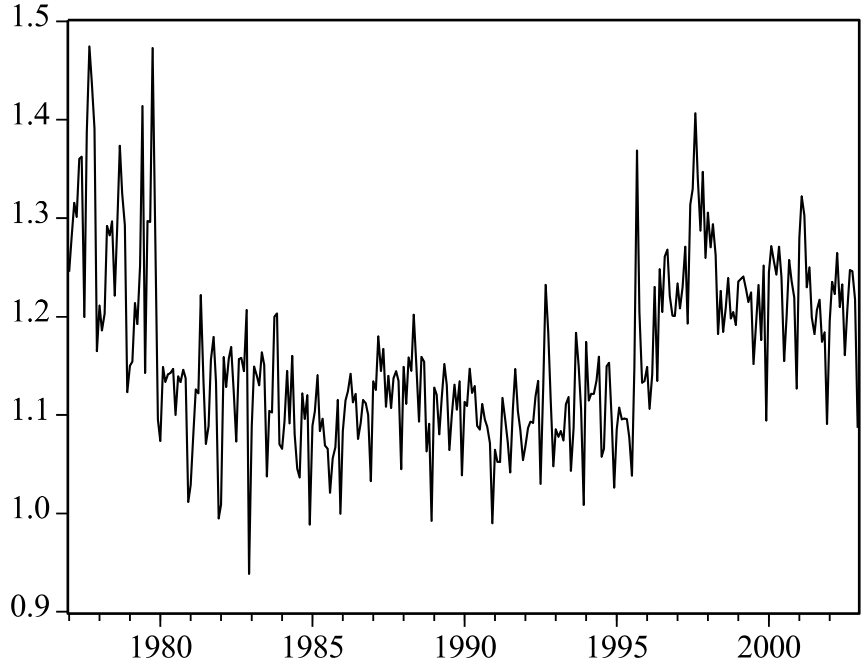

Figure 2: Standard Deviation of Differences in Growth